bivariate models where the response variables were the observations on one trait expressed in one system and the same trait in the other system. The breeding values obtained by each of these bivariate models were used to compute the correlation between EBV in an intensive fattening system and pasture and to compute the R^2-adjusted of the regression of EBV in intensive against EBV in pasture.

Results and discussion

Our results show the existence of significant GEI for growth during the post weaning period in Creole cattle, fattened in two contrasted environments. The evolution of the heritability of live weight during the post weaning period differ in each system, and the correlation between weight measured in both systems is reduced as age increases. GEI was significant also for yearling weight, average daily gain, slaughter weight, hot carcass weight and adipose tissue weight. The genetic correlations between each trait expressed in an intensive fattening system and the same trait expressed in a pasture spanned from 0.31 to 0.93. These results were in accordance with previous studies performed in the tropics (Menéndez and Mandonnet, 2006). The differences between the genetic correlations between the different traits, estimated in an intensive fattening system, and the corresponding correlations estimated in a pasture spanned from −0.53 to 0.44, and the differences between the phenotypic correlations spanned from −0.22 to 0.18. Due to the low number of animals included in the analysis and the number of offspring per sire, high standard errors of the estimates were obtained. For this reason, these differences cannot be considered as significant, except for the relationship between the empty digestive tract weight and the other traits, which were higher in pasture than in intensive fattening. This result suggests two hypotheses: that the efficiency of the digestive system of Creole cattle is such that it can extract from low nutritional level foodstuffs enough resources to be allocated simultaneously both to production traits and its own energy deposit (de Jong and van Noordwijk, 1992); and that this efficiency could be due to the higher weight of the digestive tract observed in pasture with respect to the intensive fattening system. However, the genetic relationship between tissue deposition and growth potential does not appear to differ between systems.

Conclusion

The design of breeding plans in the tropics should consider GEI affecting growth traits and carcass traits, because it can cause the expected genetic gain of the population to mismatch its expectation. Whereas, correlated responses to selection between traits in each system are expected to be similar.

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Reproductive performance and milk production of Girolando cows imported from Brazil to the Kpinnou ranch in southwest Benin

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Introduction

In Benin, the role of milk in the diet and economy of the pastoral communities is well documented. Milk contributes over 50% of annual Fulani household incomes. Despite its economic importance, food and nutritional values, and the subsequent increase in its consumption, milk is still produced in marginal quantity and national production does not meet the increasing demand. This deficit is met through imports whose economic implications are now a burden. The imports of milk and dairy products rose from 1.514 billion in 1993 to 20 billion FCFA in

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2003 (MAEP, 2004). However, average milk consumption in Benin is still low, even alarming, not exceeding 20 kg per capita per year compared to the average of 34 kg in most developing countries and 50 kg recommended by the FAO (Dossou *et al.,* 2006). To reach this level of consumption, there is need to increase national milk production threefold; and this requires a modernization of Benin milk production. Thus a breeding program focused on pure breeding, crossbreeding and dissemination of improved animals on-farm has been established by the Project of Livestock Development in the Samiondji ranch for Lagune cattle and Okpara ranch for Borgou. In addition, Girolando heifers were introduced from Brazil to Kpinnou ranch. In this study, we assessed the impact of seasonal and year of calving, lactation number and rate of blood Gir on the reproductive performance and milk production of Girolando cows imported from Brazil to Benin.

Materials and methods

The ranch of Kpinnou is located in the District of Athiémé, south-west Benin. The ranch is 400 km^2 in area. The climate is of Guinean type with two rainy seasons (April to July – S2 and October to December – S4) and two dry seasons (January to March – S1 and August to September – S3). The average annual temperature during the period of 1999–2009 was 28.2 $\pm$ 0.6°C and relative humidity averaged 73.4 $\pm$ 1.9%. The months of March and April were the hottest, while those of December and January were the coolest of the year. The annual average rainfall over the last ten years was 1351 $\pm$ 212 mm. The data on reproduction and milk production of 92 Girolando cows imported from Brazil and raised in the ranch were studied from 2005 to 2008. The data covered 92 ages at first calving; 205 intervals between calving and 205 lactations, collected from the individual cow monitoring database. We recorded the following traits: the age at first calving, calving interval, total milk production, daily milk yield, milk production at peak lactation, duration of lactation and dry period length. We used a general linear model in SAS® (1989) to test for variation in the following fixed factors: the season of calving (S1, S2, S3, S4), year of birth (2002, 2003, 2005, 2006), year of calving (2005, 2006, 2007, 2008), the lactation number (1, 2, 3) and the rate of blood Gir (25, 50 and 62.5%).

Results

The average age at first calving was 1058 $\pm$ 13 days and the average interval between successive calvings was 468 $\pm$ 14 days. The duration of lactation averaged 239 $\pm$ 3 days for a total milk production of 1739 $\pm$ 43 kg. The daily milk production was 7.2 $\pm$ 0.2 kg, the milk yield at peak lactation was 12.3 $\pm$ 0.2 kg and dry period length was 229 $\pm$ 8 days. The calving season had a significant effect ($P < 0.05$) on calving interval (482 vs. 446 vs. 437 vs. 487 days), the total milk production (1548 vs.1795 vs. 1916 vs. 1822 kg), daily milk yield (6.7 vs. 7.6 vs. 7.4 vs. 7.5 kg), milk production at peak lactation (11.4 vs. 12.8 vs. 13.9 vs. 12.3 kg), and the duration of lactation (230 vs. 236 vs. 257 vs. 244 days) and dry period length (252 vs. 210 vs. 181 vs. 243 days) for seasons S1, S2, S3 and S4 respectively. Moreover, there was a significant effect of the year of birth ($P < 0.05$) on the age at first calving (1156 vs. 1042 vs. 910 vs. 831 days) for the years 2002, 2003, 2005 and 2006 respectively. The year of calving also had a significant effect ($P < 0.05$) on calving interval (544 vs. 507 vs. 436 vs. 424 days), total milk production (1438 vs. 1412 vs. 1963 vs. 1964 kg), daily milk production (5.9 vs. 6.2 vs. 7.7 vs. 8.5 kg), milk production at peak lactation (10.3 vs. 10.3 vs. 13.3 vs. 14.5 kg), duration of lactation (225 vs. 224 vs. 252 vs. 232 days) and dry period length (298 vs. 283 vs. 184 vs. 193 days) for the years 2005, 2006, 2007 and 2008 respectively. The number of calvings had a significant effect ($P < 0.05$) on calving interval (526 vs. 433 vs. 393 days), total milk production (1367 vs. 1967 vs. 2229 kg), daily milk production (5.9 vs. vs. 8.1. 8.7 kg), milk production at peak lactation (10.3 vs. 13.1 vs. 15.9 kg), duration of lactation (230 vs. 242 vs. 257 days) and dry period length (296 vs. 190 vs. 136 days) for calving numbers 1, 2 and 3 respectively. The rate of blood Gir had a significant effect ($P < 0.05$) on age at first calving (1046 vs. 1103. vs. 876 days), calving interval (470 vs. 464 vs. 510 days), total milk production (1928 vs. 1727 vs. 1255 kg), daily milk yield (8.0 vs. 7.1 vs. 5.7 kg) for rates of blood Gir 25, 50 and 62.5% respectively. For cons, the rate of blood Gir had no significant effect ($P > 0.05$) on milk production at peak lactation, the duration of lactation and dry period length.

Conclusions

Our study showed that the Girolando cows produced better milk when calving seasons coincide with the S3, S4 and S2. The rate of blood Gir of 25% is conducive to good milk production especially in the third calving. These results may serve as a basis for breeding for increased performance of dairy herds.

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